

## **Proposed Agreement between California Energy Commission and Project Navigator, LTD**

**Title:** California Landfill Solar Project  
**Amount:** \$120,000.00  
**Term:** 24 months  
**Contact:** John Mathias  
**Committee Meeting:** 3/16/2011

### **Funding**

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Electric	Renewables	Utility-Scale Renewables	\$4,800,000	\$120,000	\$0	0%

### **Recommendation**

Approve this agreement with Project Navigator, LTD for \$120,000.00. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

### **Issue**

According to Governor Jerry Brown's new energy plan, by 2020, California should produce 20,000 new megawatts (MW) of renewable electricity. Furthermore the Governor calls for the Legislature to codify a requirement that 33% of the state's electricity be derived from renewable sources. This step will build upon Governor Arnold Schwarzenegger's Executive Order S-14-08 that directed state government agencies to take all appropriate actions to help achieve California's Renewable Portfolio Standard (RPS) goal, which requires retail sellers of electricity to serve 33 percent of their load with renewable energy by 2020.

Also in Governor Brown's energy plan is building 12,000 megawatts of Localized Electricity Generation; 8,000 Megawatts of Large Scale Renewables; and increasing combined heat and power production by 6,500 megawatts. Localized energy is onsite or small energy systems located close to where energy is consumed that can be constructed quickly (without new transmission lines) and typically with relatively low environmental impact.

Solar development and particularly utility scale solar development is crucial part of achieving these various goals in Governor Brown's energy plan. The California Public Utilities Commission (CPUC) suggests that the technology mix, for the baseline scenario to reach 33 percent by 2020, will primarily rely on wind, solar thermal, geothermal, solar photovoltaics (PV) (at generation of 44 percent, 24 percent, 15 percent, 9 percent respectively) and the rest from low levels of biomass, biogas and small hydro (generation of 4 percent, 3 percent and <1 percent respectively).

While utility scale solar development will play an important role in achieving the State's RPS target, such development has large land and water requirements, and can have negative impacts on delicate ecosystems and vulnerable species, particularly in the desert. To help address this issue the Energy Commission and California Department of Fish and Game are developing a science-driven Desert

Renewable Energy Conservation Plan (DRECP) for the Mojave and Colorado Deserts of California. The plan is intended to become the state road map for renewable energy project development that will advance state and federal conservation goals while facilitating the timely permitting of renewable energy projects in these desert regions.

However, there is also a need for new solar technologies that enable a lower impact for solar development in the desert through reducing land demand or water demand per unit generation relative to current technologies. Such solar technologies would facilitate meeting both the renewable energy goals of Governor Brown's new energy plan, as well as the conservation goals of the DRECP.

## **Background**

In response to EO S-14-08, and concern about the impact of renewable development in the California desert regions as reflected by the DRECP, the PIER Energy-Related Environmental Program in conjunction with PIER Renewables released a request for proposals (RFP) for RD&D aimed at innovative utility-scale solar energy technologies, spatial arrays, and methods of installation/maintenance that result in significantly lowered facility footprint and/or land impact, as well as innovative approaches to reduce the major fresh water consuming aspects of utility-scale solar energy.

The proposals were asked to address one or more of the following technical objectives:

- Technology solutions or approaches that will support greater solar energy penetration in the California electricity grid by reducing project specific demands on land and fresh water, such as more efficient technologies that reduce land footprint per unit solar generation.
- Innovative technologies or approaches that significantly reduce negative impacts on sensitive species and/or ecosystems for a given amount of solar generation and/or significantly improve the sustainable co-existence of the solar plant and the surrounding wildlife and environment compared to current solar technologies or approaches.
- Technologies that can better utilize areas of sub-optimal solar resources, and/or be installed on a wider or different range of slope and terrain than current solar technologies, and/or have greater flexibility in plant configuration and footprint shape, therefore expanding site selection options and opportunity for avoidance of sensitive or undisturbed habitats and increased utilization of disturbed or developed land for utility-scale solar.
- Alternative site preparation treatments with significantly reduced impacts on biological resources (for example, alternative site layouts, installation techniques that reduce grading).
- Innovative methods to mitigate the cost and performance penalties associated with the use of air cooled condensers or hybrid cooling technologies for power plant cooling (steam condensation) at solar thermal power plant projects.

Funding of \$1 million was allocated to proposals received in the environmental mitigation category of the RFP. A total of 3 proposals were received, and two were awarded. The scoring committee consisted of staff from the PIER Environmental and Renewable Programs.

## **Proposed Work**

The goal of the proposed project is to determine whether placement of a self-ballasting PV solar racking system will have an effect on the performance of a closed landfill's cap. The effects on landfill settlement and power generation performance will be measured via a closely monitored series pilot

experiment wherein single racks with PV modules will be placed in the field at a number of locations on a landfill cap. The information can be applied to permitting future PV systems on landfills. There are about 35,000 acres of landfill sites in the state that would be suitable for PV development.

The research plan to achieve the above goal involves placing the racking systems on top of a closed, capped landfill and monitoring the effects they will have on the cap using a highly instrumented system. A Sampling and Analysis Plan (SAP) will be developed that will detail the sampling activities that will be conducted, the data that will be recorded, and the frequency that the data will be sampled. Data that will be collected include MET data (wind speed, temperature, dust, and rain), landfill settlement, solar intensity, electrical generation, vegetative growth, seismic activity, and landfill cap cracking or erosion.

The work sequence is practically achievable, very realistic, and will deliver information and data relevant to the development of utility scale PV projects in urbanized areas. This project will deliver practical results, in an area where little design guidance currently exists, thereby facilitating the development of more PV on landfills, which are previously disturbed and lack the biological resource impacts of natural lands, which have been developed for solar thermal at a high environmental cost. The information and findings from the proposed work will be immediately useful in the siting and design of landfill-located PV solar projects.

The data and analysis resulting from this research will be incorporated into a white paper that will be published into the public domain and available online. The goal is for this reference to be used as a guidance manual by developers and regulators for the development of landfill-based utility scale PV energy facilities. This guidance will help developers with completing the permitting and development processes in a timely manner, thereby facilitating the development of more PV on previously disturbed lands in urbanized areas that are significantly less environmentally sensitive compared to the natural lands currently being developed for solar thermal energy.

The overall program cost will be \$160,000, of which \$120,000 will be PIER funds and \$40,000 matching funds in the form of at least two SunPods solar PV units and the associated labor in bringing units on site, instrumenting and bringing the pilot program online.

## **Justification and Goals**

This project "[will develop, and help bring to market] advanced electricity technologies that reduce or eliminate consumption of water or other finite resources, increase use of renewable energy resources, or improve transmission or distribution of electricity generated from renewable energy resources" (Public Resources Code 25620.1.(b)(4)), (Chapter 512, Statutes of 2006)).

The proposed work meets the objectives of the RFP for Environmental Mitigation for Utility-Scale Solar Energy Technologies (500-10-503), which was designed to address EO S-14-08 and the DRECP, and which is in line with Governor Brown's new energy plan. It meets the objectives by providing development guidance and performing R&D on a technology that could produce power on previously disturbed landfill sites in urban areas rather than using large areas of remote and environmentally sensitive desert lands as are being used for current large-scale solar developments. There are an estimated 35,000 acres of suitable, closed landfill sites throughout the state, which could be used to generate up to 7,000 MW of solar energy while avoiding sensitive biological resources.

In this way the project can help address the renewable electricity and localized electricity generation goals in Governor Jerry Brown's new energy plan, as well as EO S-14-08 and 2009 Integrated Energy Policy Report, while also helping support the conservation goals of the Desert Renewable Energy Conservation Plan.

This will be accomplished by:

- Providing the data and development guidance manual needed to facilitate the development of more landfill-located PV solar projects in urbanized areas.